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AF/2633

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Group:	2633	
Examiner:	Shi K. Li	
Inventor:	George H. BuAbbud	**APPEAL BRIEF**
Serial No.:	09/540,955	
Filed:	March 31, 2000	
Title:	Bidirectional Frequency Shift Coding Using Two Different Codes For Upstream And Downstream	
Atty. Docket:	766726-610049	

CERTIFICATE OF MAILING

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By Kathie G. Kopczyk

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P. O. Box 1450
Alexandria, VA 22313-1450

Sir:

This Appeal Brief is filed in response to the Final Office Action mailed August 11, 2004, which finally rejected pending claims 3, 4, 6, 7 and 10-21 of the instant application. A timely filed Notice of Appeal was mailed on November 11, 2004 pursuant to 37 C.F.R. § 1.8(a), and was received by the Office on November 15, 2004. Accordingly, the two-month date for filing this Appeal Brief is January 15, 2004. A petition for a one-month extension of time has been filed contemporaneously with this Appeal Brief.

I. Real Party In Interest

The real party in interest is Tellabs Petaluma, having a principal place of business at 1465 North McDowell Blvd., Petaluma, CA 94954.

II. Related Appeals And Interferences

There are no related appeals or interferences to the instant application.

III. Status Of Claims

Pending claims 3, 4, 6, 7, and 10-21 stand finally rejected and are appealed. Claims 1, 2, 5, 8 and 9 are cancelled.

IV. Status Of Amendments

No amendment was filed subsequent to the Final Office Action.

V. Summary Of Claimed Subject Matter

Each of the independent claims include limitations for transmitting data over an optical fiber in a first direction in a first data code at a selected wavelength of light (e.g., non-return to zero ("NRZ") data) and transmitting data over the optical fiber in a second direction in a second data code at the selected wavelength of light (e.g., Manchester data). A concise explanation of the subject matter of each of the independent claims follows. Citations in sections V.A - V.G below refer to the specification and drawings as filed.

A. Independent Claim 3

Independent claim 3 claims a method of transmitting bidirectional communication data over a single optical fiber. The first limitation comprises transmitting a first NRZ data stream (see, e.g., pg. 11, ll. 11-13) having a first clocking frequency (see, e.g., pg. 11, ll. 13-14, providing an example 25 MHz frequency) from a first location to a second location (see, e.g., Fig. 4, HDT 18 and ONU 20; pg. 12, ll. 9-14) by said optical fiber using a carrier having a selected wavelength of light (see, e.g., Fig. 4, fiber 42A, and pg. 11, ll. 17-24, providing an example 1310 nanometer light wave).

The second limitation comprises receiving said selected wavelength of light from said first location at said second location and recovering said NRZ data stream (see, e.g., Fig. 4, ONU 20, and pg. 11, ln. 25 - pg. 12, ln. 6).

The third limitation comprises receiving a second NRZ data stream having said first clocking frequency at said second location (see, e.g., Fig. 4, ONU 20; pg. 12, ll. 22-27, receiving an example 25 MHz NRZ data stream).

The fourth limitation comprises converting said second NRZ data stream to a Manchester coded data stream at a second clocking frequency which is a selected multiple of said first clocking frequency (see, e.g., Figs. 5A - 5D; pg. 13, ll. 3 - 10; pg. 14, ll. 19 - 23, providing example Manchester coded data having frequencies of 50 MHz and 75 MHz).

The fifth limitation comprises transmitting said Manchester coded data stream from said second location to said first location by said optical fiber at said selected wavelength of light (see, e.g. Fig. 4, ONU 20, fiber 42A and HDT 18; pg. 14, ln. 23 - pg. 15, ln. 2).

The sixth limitation comprises receiving said Manchester coded data stream at said first location (see, e.g., Fig. 4, HDT 18, photodiode 55; pg. 14, ln. 26 - pg. 15, ln. 2).

The last limitation comprises converting said Manchester coded data stream to an NRZ data stream having said first frequency (see, e.g., pg. 15, ll. 2 - 4).

In this claimed method of claim 3, the second clocking frequency is three times (3x) said first clocking frequency, and the Manchester coded data stream includes three (3) pulses for each data bit. Additionally, a voting of said three (3) pulses to determine at least two (2) equivalent pulses and providing an output NRZ data bit at said first frequency equivalent to said at least two (2) equivalent Manchester data bits is performed (see, e.g., Figs. 5A - 5D; pg. 13, ll. 4-24).

B. Independent Claim 7

Independent claim 7 claims an apparatus for transmitting bidirectional communication data over a single optical fiber. The apparatus includes a first data source for providing a first electrical digital data stream coded as an NRZ data stream and at a selected clocking pulse rate (see, e.g., Fig. 4, HDT 18, conductor 68; pg. 11, ll. 11-15).

The apparatus also includes a first light generator at a first location for generating light at a selected wavelength, said light generator connected to said first data source for receiving said NRZ coded data stream and for modulating light generated by said first light generator with said NRZ coded data (see, e.g., Fig. 4, laser driver 67 and laser diode 68; pg. 11, ll. 17-20).

The apparatus also includes an optical fiber extending from said first location to a second location for transmitting bidirectional light there between (see, e.g., Fig. 4, fiber 42A).

The apparatus also includes a first light detection device at said second location for receiving said light modulated by said NRZ coded data stream and for recovering said NRZ coded electrical digital data stream (see, e.g., Fig. 4, ONU 20 and photodiode 59; pg. 11, ln. 25 - pg. 12, ln. 3).

The apparatus also includes a second data source for providing a second electrical digital data stream coded as an NRZ data stream at said selected clocking pulse rate (see, e.g., Fig. 4, ONU 20, conductor 100 conducting 25 MHz NRZ data).

The apparatus also includes a source for providing clocking pulses at said selected clocking pulse rate (see, e.g., Fig. 4, conductor 114).

The apparatus also includes a clock multiplier for multiplying said selected clocking pulse rate at least three times (3x) (see, e.g., Fig. 4, clock multiplier 116; pg. 14, ll. 19 - 22).

The apparatus also includes a Manchester coding device connected to said clock multiplier for receiving said NRZ coded data stream and for converting said NRZ coded data stream at said selected clocking pulse rate to a Manchester coded data stream having pulses at a clocking pulse rate at least three times (3x) said selected clocking pulse rate (see, e.g., Fig. 4, Manchester encoder 102; pg. 14, ll. 21 - 23).

The apparatus also includes a second light generator at said second location for generating light at said selected wavelength, said second light generator connected for receiving said Manchester coded electrical digital data stream and for modulating light generated by said second light generator with said Manchester coded data stream (see, e.g., Fig. 4, laser driver 122 and photo diode 61; pg. 14, ll. 22 - 26).

The apparatus also includes a second light detection device at said first location for receiving said light modulated by said Manchester coded electrical digital data stream and for recovering said Manchester coded electrical digital data stream (see, e.g., photo diode 55, pg. 14, ln. 26 - pg. 15, ln. 2).

The apparatus also includes a Manchester decoding device for receiving said Manchester coded electrical digital data stream and converting said received data stream to an NRZ coded

data stream at said selected clocking pulse rate (see, e.g., Manchester decoder 130; pg. 15, ll. 2-4).

The Manchester coded data stream of claim 7 includes three (3) pulses for each data bit and the Manchester decoding device is adapted to vote the three (3) pulses to determine at least two (2) equivalent pulses and provides an output NRZ data bit at the selected clocking pulse rate equivalent to the at least two (2) equivalent Manchester data bits (see, e.g., Figs. 5A - 5D; pg. 13, ll. 4-24).

C. Independent Claim 12

Independent claim 12 claims a method of bidirectional communication over a single optical fiber. The first limitation comprises transmitting over the optical fiber in a first direction first digital data in a first data code at a first clock frequency and at a first wavelength (see, e.g., pg. 11, ll. 11-14, conductor 68 providing example first NRZ data at a 25 MHz frequency; Fig. 4, fiber 42A, and pg. 11, ll. 17-24, providing an example 1310 nanometer light wave).

The second limitation comprises converting second digital data in the first data code to a second data code at a second clock frequency, the second clock frequency a multiple of the first clock frequency (see, e.g., Fig. 4, conductor 100, clock multiplier 116 and Manchester encoder 102, providing second NRZ digital data and converting it to Manchester encoded data at 75 MHz; pg. 14, ln. 19 - 23).

The third limitation comprises transmitting over the optical fiber in a second direction the second digital data in the second data code at the second clock frequency and at the first wavelength (see, e.g., Fig. 4, fiber 42A; pg. 14, ln. 23 - pg. 15, ln. 2).

The last limitation comprises converting the second digital data from the second data code to the first data code by setting each bit of the second digital data in the first data code equal to a majority of corresponding bits of the second digital data in the second data code (see, e.g., Fig. 4, Manchester decoding and voting circuit 130; Figs. 5A - 5D; pg. 13, ll. 4-24).

D. Independent Claim 16

Independent claim 16 claims a system for bidirectional communication over a single optical fiber.

A first means-plus-function element comprises means for transmitting over the optical fiber in a first direction first digital data in a first data code at a first clock frequency and at a first wavelength. The corresponding structure for performing the recited function comprises the laser driver 67 and the laser diode 68 of Fig. 4, and as described at pg. 11, ll. 17 - 20.

A second means-plus-function element comprises means for converting second digital data in the first data code to a second data code at a second clock frequency, the second clock frequency a multiple of the first clock frequency. The corresponding structure for performing the recited function comprises the clock multiplier 116 and Manchester encoder 102 of Fig. 4, and as described at pg. 14, ll. 19 - 23.

A third means-plus-function element comprises means for transmitting over the optical fiber in a second direction the second digital data in the second data code at the second clock frequency and at the first wavelength. The corresponding structure for performing the recited function comprises the laser driver 122 and laser diode 61 of Fig. 4, and as described at pg. 14, ll. 23 - 26.

A fourth means-plus-function element comprises means for converting the second digital data from the second data code to the first data code by setting each bit of the second digital data in the first data code equal to a majority of corresponding bits of the second digital data in the second data code. The corresponding structure for performing the recited function comprises the quantizer 128 and Manchester decoding and voting circuit 130, and as described at pg. 15, ll. 2-6.

E. <u>Independent Claim 17</u>

Independent claim 17 claims a method of bidirectional communication over a single optical fiber. The first limitation comprises transmitting over the optical fiber in a first direction and at a first wavelength first digital data in a first data code (see, e.g., pg. 11, ll. 11-14, conductor 68 providing example first NRZ data at a 25 MHz frequency; Fig. 4, fiber 42A, and pg. 11, ll. 17-24, providing an example 1310 nanometer light wave).

The second limitation comprises converting second digital data in the first data code to a second data code so that the power spectrum of the second digital data in the second data code is substantially separated from the power spectrum of the first digital data in the first data code (see, e.g., Fig. 4, conductor 100, clock multiplier 116 and Manchester encoder 102, providing second NRZ digital data and converting it to Manchester encoded data at 75 MHz; pg. 13, ln. 24 - pg. 14, ln. 23).

The third limitation comprises including multiple corresponding data bits in the second digital data in the second data code for each data bit of the second digital data in the first data code (see, e.g., Figs. 5A - 5D; pg. 13, ll. 3 - 23).

The fourth limitation comprises transmitting over the optical fiber in a second direction and at the first wavelength the second digital data in the second data code (see, e.g., Fig. 4, fiber 42A; pg. 14, ln. 23 - pg. 15, ln. 2).

The fifth limitation comprises converting the second digital data from the second data code to the first data code by setting each corresponding data bit of the second digital data in the first data code equal to a majority of equivalent bits in the multiple corresponding data bits in the second data code (see, e.g., Figs. 5A - 5D; pg. 13, ll. 3 - 23).

F. <u>Independent Claim 20</u>

Independent claim 20 claims a system for bidirectional communication over a single optical fiber. The system includes a first transmitter circuit configured to transmit over the optical fiber in a first direction and at a first wavelength first digital data in a first data code (see, e.g., Fig. 4, laser driver 67 and laser diode 68; pg. 11, ll. 17 - 20).

The system also includes a first converting circuit configured to convert second digital data in the first data code to a second data code so that the power spectrum of the second digital data in the second data code is substantially separated from the first digital data in the first data code and to include multiple corresponding data bits in the second digital data in the second data code (see, e.g., Fig. 4, clock multiplier 116 and Manchester encoder 102; pg. 13, ln. 24 - pg. 14, ln. 23).

The system also includes a second transmitter circuit configured to transmit over the optical fiber in a second direction and at the first wavelength the second digital data in the second data code (see, e.g., Fig. 4, laser driver 122 and laser diode 61; pg. 14, ll. 23 - 26).

The system also includes a receiver circuit configured to receive the second digital data in the second data code and convert the second digital data from the second data code to the first data code by setting each corresponding data bit of the second digital data in the first data code equal to a majority of equivalent bits in the multiple corresponding data bits in the second data code (see, e.g., Fig. 4, quantizer 128 and Manchester decoding and voting circuit 130; pg. 15, ll. 2-6).

G. <u>Independent Claim 21</u>

Independent claim 21 claims a method of transmitting bidirectional communication data over a single optical fiber. The first limitation comprises transmitting a first NRZ data stream (see, e.g., pg. 11, ll. 11-13) having a first clocking frequency (see, e.g., pg. 11, ll. 13-14, providing an example 25 MHz frequency) from a first location to a second location (see, e.g., Fig. 4, HDT 18 and ONU 20; pg. 12, ll. 9-14) by said optical fiber using a carrier having a selected wavelength of light (see, e.g., Fig. 4, fiber 42A, and pg. 11, ll. 17-24, providing an example 1310 nanometer light wave).

The second limitation comprises receiving said selected wavelength of light from said first location at said second location and recovering said NRZ data stream (see, e.g., Fig. 4, ONU 20, and pg. 11, ln. 25 - pg. 12, ln. 6).

The third limitation comprises receiving a second NRZ data stream having said first clocking frequency at said second location (see, e.g., Fig. 4, ONU 20; pg. 12, ll. 22-27, receiving an example 25 MHz NRZ data stream).

The fourth limitation comprises converting said second NRZ data stream to a Manchester coded data stream at a second clocking frequency which is a selected multiple of said first

clocking frequency (see, e.g., Figs. 5A - 5D; pg. 13, ll. 3 - 10; pg. 14, ll. 19 - 23, providing example Manchester coded data having frequencies of 50 MHz and 75 MHz).

The fifth limitation comprises transmitting said Manchester coded data stream from said second location to said first location by said optical fiber at said selected wavelength of light (see, e.g., Fig. 4, ONU 20, fiber 42A and HDT 18; pg. 14, ln. 23 - pg. 15, ln. 2).

The sixth limitation comprises receiving said Manchester coded data stream at said first location (see, e.g., Fig. 4, HDT 18, photodiode 55; pg. 14, ln. 26 - pg. 15, ln. 2).

The last limitation comprises converting said Manchester coded data stream to an NRZ data stream having said first frequency (see, e.g., pg. 15, ll. 2 - 4).

VI. Grounds Of Rejection To Be Reviewed On Appeal

Claims 3, 4, 6, 7, 10, and 12-20 stand rejected as being obvious under 35 U.S.C § 103(a) over U.S. Patent 5,459,607, issued to Fellows, in view of U.S. Patent 5,491,474, issued to Neidlinger, and further in view of U.S. Patent No. 5,719,904, issued to Kim. Claim 21 stands rejected as being obvious under 35 U.S.C § 103(a) over Fellows in view of Neidlinger.

VII. Argument

A. Summary

Each of the independent claims include limitations for transmitting data over an optical fiber in a first direction in a first data code at a selected wavelength of light (e.g., NRZ data) and transmitting data over the optical fiber in a second direction in a second data code at the selected wavelength of light (e.g., Manchester data). Neidlinger, however, teaches that bidirectional communication (NRZ in a first direction, DPSK in the second direction) is to be accomplished

by transmitting at <u>a first wavelength of light</u> in the first direction and transmitting <u>at a second wavelength of light</u> in the second direction. See, e.g., Neidlinger, col. 3, ln. 50 - col. 4, ln. 25. Additionally, Fellows specifically teaches that the data is to be transmitted in <u>both directions using Manchester encoding</u>, and further teaches away from transmitting NRZ data. See, e.g., Fellows, col. 1, ll. 36-45; col. 2, ll. 26-42.

The Applicant respectfully submits that the rejections are improper because 1) Neidlinger teaches away from the claimed invention; 2) Fellows teaches away from the claimed invention; and 3) one of ordinary skill would not be motivated to combine Neidlinger and Fellows.

B. <u>Summary Of The Prior Art</u>

Neidlinger teaches a bidirectional waveguide telecommunications system that transmits NRZ data in a first direction at a first wavelength and DPSK data in a second direction at a second wavelength. See, e.g., Neidlinger, col. 3, ln. 50 - col. 4, ln. 25. Neidlinger states that for decoupling the electro-optical transducer LD and opto-electrical reception transducer PD, <u>and also for directional separation</u>, a wavelength-division multiplexer WDM is inserted between the associated light waveguide subscriber line OAL-OB and both the opto-electrical reception transducer PD and electro-optical transmission transducer LD of each station. Col. 3, ll. 54-61 (emphasis added). Thus, the system in Neidlinger transmits in the upstream direction at a first wavelength and in the downstream direction at a second wavelength.

Neidlinger praises the disclosed system as an improvement over prior art systems that transmit bidirectionally over the same wavelength. In particular, Neidlinger discusses the prior art reference by K. Kaede et al., "A Passive Double Star Optical Subscriber System With Frequency Division Duplex Transmission And Flexible Access," IEICE Trans. Communication

Vol. E75-B No. 9, Sept. 1992 ("Kaede"). Kaede teaches a single wavelength bidirectional transmission comprising a pulsed PSK transmission in a first direction and a baseband transmission in the second direction. Kaede, pg. 845, col. 1. Neidlinger, however, criticizes Kaede, and other art, stating that:

> A spectral separation of the signals of different transmission directions thus becomes possible in the electrical part of the receiver; disturbances due to increased shot noise, amplitude noise (RIN-Relative Intensity Noise) of the light source and a possible heterodyne effect are thereby not suppressed. Since a burst-like signal is present in the baseband in the upstream direction, special measures for a fast, time-dependent and amplitude-dependent response of the receiver of the central station are required in general, particularly in the case of different signal levels of the signals arriving in the central station proceeding from the individual decentralized stations.

Neidlinger, col. 1, ln. 62 - col. 2, ln. 6. Further, a stated object of Neidlinger is to "avoid the aforementioned disadvantages in the telecommunications systems" such as Kaede. Neidlinger, col. 2, ll. 14-19.

Fellows teaches transmitting Manchester coded data in first and second directions over a single optical fiber at the same wavelength. Fellows, Fig. 1, col. 3, ln. 62 - col. 4, ln. 47. The clock speeds of the data encoded differ for each direction for spectral separation. Fellows, col. 4, ll. 41 - 48. Fellows, however, teaches that the coding selected for each direction of the bi-directional communication "should have the characteristics of having low energy components in areas outside their designed frequency of primary operation..." Fellows, col. 4, ll. 44-48. Consistent with this teaching, Fellows criticizes the transmission of NRZ data in a bidirectional, single wavelength transmission system:

> It has been found that simultaneous bidirectional transmission of optical signals may be a desired technique leading to a better functional and cost based system for this application. However, such diplexing techniques of equal wavelength digital bit streams require the use of optical couplers to separate the optical signal information bits. Optical couplers provide a certain degree of optical isolation but

> reflections of standard non-return to zero (NRZ) line coded signals at the fiber interface will substantially degrade the detected signal to noise ratio.
>
> Thus, in conventional NRZ transmission systems, the spectrum extends from a low frequency determined by the maximum run length of ones or zeros to a maximum frequency approaching the bit rate of the data stream. The low frequency components from the high speed data stream will degrade the signal to noise ratio of the low speed data stream and, conversely, the spectrum of the low speed data stream will contribute noise to the high speed data stream. The result will be errors in the data output. Accordingly, it would appear that use of optical couplers in a diplex mode, single fiber medium would have technical restrictions in the application to remote synchronous digital optical fiber systems.

Fellows, col. 1, ll. 36 - 59. Additionally, Fellows emphasizes an aspect of the invention that uses line codes different from NRZ codes:

> Further according to another aspect of the invention, the transmission medium for the system of the type described comprises a single fiber operating in a diplex mode. Signal to noise ratio degradation and other interference due tic [*sic,* to] use of optical couplers or diplex mode transmission are reduced by shaping the spectrum of the transmitted optical data streams through the single fiber in the opposite directions. Thus the present invention uses a line code, different from the conventional NRZ line codes, that has a power curve that falls away quickly from the desired center or clock frequency. One such suitable code is a bi-phase or Manchester coding that yields a substantial improvement in received signal to noise ratio of both the low speed and high speed channels. In the case of the high speed channel, the high-frequency effects of the low speed signals are filtered out with very little degradation of the data waveshape, since there is very little energy in the low frequency region of the Manchester coded optical data stream.

Fellows, col. 2, ll. 26 - 43.

C. <u>Claims 3, 7, 16 and 21 Are Not Obvious Over Neidlinger And Fellows</u>

Both Neidlinger and Fellows teach away from claims 3, 7, 16 and 21, and thus the rejection of these claims over Neidlinger and Fellows, either in whole or in part, is improper. Furthermore, one of ordinary skill in the art would not be motivated to combine Neidlinger and Fellows to arrive at the claimed inventions of claims 3, 7, 16 and 21.

"A prior art reference may be considered to teach away when 'a person of ordinary skill, upon reading the reference, would be discouraged from following the path set out in the reference, or would be led in a direction divergent from the path that was taken by the applicant.'" Monarch Knitting Mach. Corp. v. Sulzer Morat Gmbh, 139 F.3d 877, 885, 45 USPQ2d 1977 (Fed. Cir. 1998) (citing In re Gurley, 27 F.3d 551, 553, 31 USPQ2d 1130 (Fed. Cir. 1994)). Each reference must be considered as a whole, including portions that would lead away from the claimed invention. W.L. Gore & Associates v. Garlock, Inc., 721 F.2d 1540, 1550, 220 USPQ2d 303, 311 (Fed. Cir. 1983). A reference may teach away if it seeks to avoid the applicant's claimed invention due to its perceived undesirability. In re Fine, 837 F.2d 1071, 1074, 5 USPQ2d 1596 (Fed. Cir. 1998) (finding error to combine a prior art nitrogen-related detector with a sulfur-detection system that sought to avoid the presence of nitrogen-related compounds to arrive at the claimed nitrogen detection invention).

Each of the independent claims 3, 7, 16 and 21 include limitations for transmitting NRZ data over an optical fiber in a first direction at a first clock speed at a selected wavelength of light and transmitting Manchester encoded data over the optical fiber in a second direction at a second clock speed at the selected wavelength of light. As set forth above, however, Neidlinger teaches that bidirectional communication (NRZ in a first direction, DPSK in the second direction) is to be accomplished by transmitting at a first wavelength in the first direction and transmitting at a second wavelength in the second direction. See, e.g., Neidlinger, col. 3, ln. 50 - col. 4, ln. 25. In support of this teaching, Neidlinger criticizes the prior art teachings of bidirectional, single wavelength baseband transmission systems. Neidlinger, col. 1, ln. 62 - col. 2, ln. 6; col. 2, ll. 14-19.

Also as set forth above, Fellows specifically teaches that the data is to be transmitted in both directions using Manchester encoding, and further teaches that the coding technique used have a spectral power curve that falls away quickly from the desired center frequency. See, e.g., Fellows, col. 1, ll. 36-45; col. 2, ll. 26-42. As shown in Fig. 2 of Fellows, the NRZ power curve falls away beginning at baseband, and not from the desired center frequency. Fellows, Fig. 2; col. 4, ln. 49 - col. 5, ln. 9. Thus, the NRZ data is Manchester encoded before it is transmitted over the fiber optic cable.

The inventions of claims 3, 7, 16 and 21, however, teach the transmission of baseband NRZ data in a first direction at a first wavelength and transmission of Manchester encoded data in a second direction at the first wavelength. Thus, the Applicant traversed the rejection over Fellows and Neidlinger on the grounds that Fellows and Neidlinger taught away from the claimed invention. In the Final Office Action of August 11, 2004, the Examiner replied that Neidlinger "does not teach or suggest that using the same wavelength for both directions will not work," and thus found that Neidlinger did not teach away from the invention. Paper No. 12, pg. 6. The Examiner's requirement for a direct finding of inoperability of the claimed invention in the prior art is not, however, the proper standard to determine whether a reference teaches away from a claimed invention. See, e.g., Monarch Knitting Mach. Corp., 139 F.3d at 885; In re Gurley, 27 F.3d at 553; In re Fine, 837 F.2d at 1074. Applying the proper test, both Neidlinger and Fellows deliberately seek to avoid the inventions of claims 3, 7, 16 and 21, and thus one of ordinary skill "would be led in a direction divergent from the path that was taken by the applicant." Monarch Knitting Mach. Corp., 139 F.3d at 885; In re Fine, 837 F.2d at 1074. Accordingly, because both references teach away from claims 3, 7, 16 and 21, the rejections of claims 3, 7, 16 and 21, and all claims depending directly or indirectly therefrom, is improper.

Finally, the Applicant submits that there is no motivation to combine the references, as such combination would go against the teachings of each reference. Each of the references must be considered as a whole, including portions that would lead away from the claimed invention. W.L. Gore & Associates, 721 F.2d at 1550. The Applicant respectfully submits that no motivation to combine exists when (1) Neidlinger is directed to a bidirectional WDM system having two encoding schemes at different wavelengths, which teaches away from the claimed invention and also teaches away from Fellows; and (2) Fellows is directed to a bidirectional system having a single encoding scheme and at a single wavelength, which teaches away from the invention and also teaches away from Neidlinger. Indeed, it appears that the rejection is based on impermissible hindsight rather than a motivation to combine from the references.

In the Final Office Action of August 11, 2004, the Examiner stated that one of ordinary skill in the art would be motivated to combine Fellows and Neidlinger because:

> Neidlinger et al. further teaches to use a NRZ baseband signal for downstream to assure a reliable clock regeneration (see col. 2, line 66 - col. 3, line 2). Fellows suggests in Fig. 2 that the overlapping of upstream and downstream traffic is minimized if NRZ is used for low speed clock frequency and Manchester is used for high speed clock frequency.

Paper No. 12, pg. 7. Fellows, however, uses Fig. 2 to illustrate line codes having the characteristic of low energy components outside their designed frequency, and to stress the benefit of the low spectral energy components outside of the central frequency of each Manchester encoded signal. Fellows, Fig. 2; col. 4, ll. 39-60. The NRZ data of Fig. 2 in Fellows is thus Manchester encoded in both directions before transmitting over a fiber optic cable. Therefore, under the Examiner's rationale for a motivation to combine, one of ordinary skill in the art would have to completely disregard the teachings of Fellows before combining with Neidlinger.

"Obviousness is tested by what the combined teaching of the references would have suggest to those of ordinary skill in the art." In re Fine, 837 F.2d at 1075. "But it cannot be established by combining the teachings of the prior art to produce the claimed invention, absent some teaching or suggestion supporting the combination." Id. Here, the prior art not only does not provide a suggestion or motivation to combine, it actually warns against such combination. Accordingly, the rejections of claims 3, 7, 16 and 21, and all claims depending directly or indirectly therefrom, is improper.

For the reasons set forth above, the Applicant requests that the rejection of claims 3, 7, 16 and 21, and all claims depending directly or indirectly therefrom, be withdrawn.

D. Claims 12, 17 and 20 Are Not Obvious Over Neidlinger And Fellows

The relevant limitations of claims 12, 17 and 20 are similar to those of claims 3, 7 and 21, except that claims 12, 17 and 20 recite the transmission of a first data code in a first direction at a first clock frequency and at a first wavelength (e.g., NRZ data), and the transmission in a second direction a second data code at a second clock frequency and at the first wavelength (e.g., Manchester encoded data). For the same reasons as set for in Section VII.C. above, the Applicant submits that the rejection of claims 3, 7, 16 and 21, and all claims depending directly or indirectly therefrom, be withdrawn.

VIII. Claims Appendix

A claims appendix containing a copy of the claims subject to this appeal is attached.

IX. Evidence Appendix

None.

X. Related Proceedings Appendix

None.

The Commissioner is hereby authorized to charge any additional fees and credit any overpayment associated with this Appeal to Jones Day Deposit Account No. 501432, ref: 766726-610049.

Respectfully submitted,
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CLAIMS APPENDIX

1. (Cancelled)

2. (Cancelled)

3. (Previously Presented) A method of transmitting bidirectional communication data over a single optical fiber comprising the steps of:

transmitting a first NRZ data stream having a first clocking frequency from a first location to a second location by said optical fiber using a carrier having a selected wavelength of light;

receiving said selected wavelength of light from said first location at said second location and recovering said NRZ data stream;

receiving a second NRZ data stream having said first clocking frequency at said second location;

converting said second NRZ data stream to a Manchester coded data stream at a second clocking frequency which is a selected multiple of said first clocking frequency;

transmitting said Manchester coded data stream from said second location to said first location by said optical fiber at said selected wavelength of light;

receiving said Manchester coded data stream at said first location; and

converting said Manchester coded data stream to an NRZ data stream having said first frequency;

wherein said second clocking frequency is three times (3x) said first clocking frequency, and said Manchester coded data stream includes three (3) pulses for each data bit and further comprising voting said three (3) pulses to determine at least two (2) equivalent pulses and

providing an output NRZ data bit at said first frequency equivalent to said at least two (2) equivalent Manchester data bits.

4. (Previously Presented) The method of claim 3 wherein said first clocking frequency is about 25 MHZ.

5. (Cancelled)

6. (Previously Presented) The method of claim 3 and further including the step of filtering said first NRZ data stream with a low pass filter prior to said transmitting step.

7. (Previously Presented) Apparatus for transmitting bidirectional communication data over a single optical fiber comprising:

a first data source for providing a first electrical digital data stream coded as an NRZ data stream and at a selected clocking pulse rate;

a first light generator at a first location for generating light at a selected wavelength, said light generator connected to said first data source for receiving said NRZ coded data stream and for modulating light generated by said first light generator with said NRZ coded data;

an optical fiber extending from said first location to a second location for transmitting bidirectional light there between;

a first light detection device at said second location for receiving said light modulated by said NRZ coded data stream and for recovering said NRZ coded electrical digital data stream;

a second data source for providing a second electrical digital data stream coded as an NRZ data stream at said selected clocking pulse rate;

a source for providing clocking pulses at said selected clocking pulse rate;

a clock multiplier for multiplying said selected clocking pulse rate at least three times (3x);

a Manchester coding device connected to said clock multiplier for receiving said NRZ coded data stream and for converting said NRZ coded data stream at said selected clocking pulse rate to a Manchester coded data stream having pulses at a clocking pulse rate at least three times (3x) said selected clocking pulse rate;

a second light generator at said second location for generating light at said selected wavelength, said second light generator connected for receiving said Manchester coded electrical digital data stream and for modulating light generated by said second light generator with said Manchester coded data stream;

a second light detection device at said first location for receiving said light modulated by said Manchester coded electrical digital data stream and for recovering said Manchester coded electrical digital data stream; and

a Manchester decoding device for receiving said Manchester coded electrical digital data stream and converted said received data stream to an NRZ coded data stream at said selected clocking pulse rate;

wherein said Manchester coded data stream includes three (3) pulses for each data bit and the Manchester decoding device is adapted to vote said three (3) pulses to determine at least two (2) equivalent pulses and provide an output NRZ data bit at said selected clocking pulse rate equivalent to said at least two (2) equivalent Manchester data bits.

8. (Cancelled)

9. (Cancelled)

10. (Previously Presented) The apparatus of claim 7 and further including a first low pass filter between said first data source and said first generator and a second low pass filter located after said first light detection means.

11. (Original) The apparatus of claim 10 and further including a first band pass filter between said Manchester coding device and said second light generator and a second band pass filter between said second light detection device and said Manchester decoding device.

12. (Previously Presented) A method of bidirectional communication over a single optical fiber comprising the steps of:

transmitting over the optical fiber in a first direction first digital data in a first data code at a first clock frequency and at a first wavelength;

converting second digital data in the first data code to a second data code at a second clock frequency, the second clock frequency a multiple of the first clock frequency;

transmitting over the optical fiber in a second direction the second digital data in the second data code at the second clock frequency and at the first wavelength; and

converting the second digital data from the second data code to the first data code by setting each bit of the second digital data in the first data code equal to a majority of corresponding bits of the second digital data in the second data code.

13. (Previously Presented) The method of claim 12, wherein:

the step transmitting over the optical fiber in a first direction first digital data in a first data code at a first clock frequency comprises the step of transmitting NRZ data; and

the step of transmitting over the optical fiber in a second direction the second digital data in the second data code at the second clock frequency comprises the step of transmitting Manchester coded data.

14. (Previously Presented) The method of claim 13, wherein the second clock frequency is three times the first clock frequency, and the Manchester coded data includes three bits for each bit of second digital data in the first data code.

15. (Previously Presented) The method of claim 14, wherein the step of converting the second digital data from the second data code to the first data code by setting each bit of the second digital data in the first data code equal to a majority of corresponding bits of the second digital data in the second data code comprises the step of voting the three bits to determine at least two equivalent bits and providing an output NRZ data bit at the first clock frequency equivalent to the at least two equivalent bits.

16. (Previously Presented) A system for bidirectional communication over a single optical fiber comprising:

means for transmitting over the optical fiber in a first direction first digital data in a first data code at a first clock frequency and at a first wavelength;

means for converting second digital data in the first data code to a second data code at a second clock frequency, the second clock frequency a multiple of the first clock frequency;

means for transmitting over the optical fiber in a second direction the second digital data in the second data code at the second clock frequency and at the first wavelength; and

means for converting the second digital data from the second data code to the first data code by setting each bit of the second digital data in the first data code equal to a majority of corresponding bits of the second digital data in the second data code.

17. (Previously Presented) A method of bidirectional communication over a single optical fiber comprising the steps of:

transmitting over the optical fiber in a first direction and at a first wavelength first digital data in a first data code;

converting second digital data in the first data code to a second data code so that the power spectrum of the second digital data in the second data code is substantially separated from the power spectrum of the first digital data in the first data code;

for each data bit of the second digital data in the first data code, including multiple corresponding data bits in the second digital data in the second data code;

transmitting over the optical fiber in a second direction and at the first wavelength the second digital data in the second data code; and

converting the second digital data from the second data code to the first data code by setting each corresponding data bit of the second digital data in the first data code equal to a majority of equivalent bits in the multiple corresponding data bits in the second data code.

18. (Previously Presented) The method of claim 17, wherein:

the step transmitting over the optical fiber in a first direction first digital data in a first data code comprises the step of transmitting NRZ data at a first clock frequency; and

the step of transmitting over the optical fiber in a second direction the second digital data in the second data code comprises the step of transmitting Manchester coded data at a second clock frequency.

19. (Previously Presented) The method of claim 18, wherein the step of converting the second digital data from the second data code to the first data code by setting each corresponding data bit of the second digital data in the first data code equal to a majority of equivalent bits in the multiple corresponding data bits in the second data code comprises the step

of the voting the three bits to determine at least two equivalent bits and providing an output NRZ data bit at the first clock frequency equivalent to the at least two equivalent bits.

20. (Previously Presented) A system for bidirectional communication over a single optical fiber comprising the steps of:

a first transmitter circuit configured to transmit over the optical fiber in a first direction and at a first wavelength first digital data in a first data code;

a first converting circuit configured to covert second digital data in the first data code to a second data code so that the power spectrum of the second digital data in the second data code is substantially separated from the first digital data in the first data code and to include multiple corresponding data bits in the second digital data in the second data code;

a second transmitter circuit configured to transmit over the optical fiber in a second direction and at the first wavelength the second digital data in the second data code; and

a receiver circuit configured to receive the second digital data in the second data code and convert the second digital data from the second data code to the first data code by setting each corresponding data bit of the second digital data in the first data code equal to a majority of equivalent bits in the multiple corresponding data bits in the second data code.

21. (Previously Presented) A method of transmitting bidirectional communication data over a single optical fiber comprising the steps of:

transmitting a first NRZ data stream having a first clocking frequency from a first location to a second location by said optical fiber using a carrier having a selected wavelength of light;

receiving said selected wavelength of light from said first location at said second location and recovering said NRZ data stream;

receiving a second NRZ data stream having said first clocking frequency at said second location;

converting said second NRZ data stream to a Manchester coded data stream at a second clocking frequency which is a selected multiple of said first clocking frequency;

transmitting said Manchester coded data stream from said second location to said first location by said optical fiber at said selected wavelength of light;

receiving said Manchester coded data stream at said first location; and

converting said Manchester coded data stream to an NRZ data stream having said first frequency.